

AVIATION

The Oldest American Aeronautical Magazine

DECEMBER 31, 1923

Issued Weekly

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Ready for emergency: U. S. Naval Torpedo Plane Squadron taking off

VOLUME
XV

SPECIAL FEATURES

NUMBER
27

THE DUKE OF SUTHERLAND'S VISIT
REMINISCENCES OF THE WRIGHT BROTHERS
AIR SERVICE RESERVE OF SOUTHERN CALIFORNIA
A NEW PROCESS IN STEEL CYLINDER CONSTRUCTION

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225 FOURTH AVENUE, NEW YORK



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DECEMBER 31, 1923

AVIATION

Published every Monday

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IN FAR AWAY CHINA

AVIATION Readers Encircle the World

The following letter has been received from Canton, China. It is typical of many that are received from readers throughout the world and shows how indispensable AVIATION is if a complete picture of the progress of American aeronautics is desired.

From an old Subscriber

"Enclosed please find ten dollars for which please renew my subscription to AVIATION. In the event that you have discontinued sending the magazine to my old address, please if possible send me the copies I have missed. AVIATION has been my greatest authority since the great-crisis days of '16, as production manager of — Works building airplanes during the war and later as field manager of a division of the Air Mail and now as aeronautical adviser to Dr. Sun Yat Sen in far away China.

"I have been a subscriber to your magazine since it was first published, in fact, I still have my first copy, now seven years old as well as all copies up until the time I came here.

"I have certainly derived great pleasure and much valuable information from your indispensable paper."

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Vol. XV

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AVIATION

Aviation—1923

TWENTY years of the airplane have passed to history. Speed, endurance, altitude, load and power have all been an record to a point where further progress is going to be the result of engineering research and great expenditure. With the astonishing record of 1923 in mind it will be a very real word that does not project its imagination about a few years and not even the splendid achievements of this year left to be told.

The outstanding advances have been made in speed. Lawrence T. Williams, U.S.N., in the Navy Curtiss Xaver achieved the world's records to 260.00 mi/hr for three kilometers (1,554 mi.); 243.60 mi/hr for 300 km. (362 1/2 mi.) and 241.07 mi/hr for 200 km. (124 2/3 mi.). Louis David Boucher, U.S.N., brought the Schneider Trophy to this country by establishing a new speed record for seaplanes of 273.30 mi/hr. Of the thirty-three world records, twenty-one have been captured by the Naval Bureau of Aeronautics and eleven by the Army Air Service.

The Army records include all records from 500 to 2,500 km and were accomplished by refueling in flight. Leland Oakley Kelly and J. A. Mitty made a world's duration record of 33 hr. 4 min. 31 sec. which was bettered later by Lawrence H. Smith and J. P. Richter who were in the air 37 hr. 15 min. 43.8 sec.

The reconnaissance of the Shenandoah and its spectacular flight over the country is an achievement of which the Navy men will be proud. The further development of the catapult and the cruises of the fleet air forces are also to the Navy's credit.

The Army Air Service commissioned and flew the Harling Fowler, the largest airplane yet constructed, and successfully set the obsolete endurance Virginia and New Jersey. The cross-country day-night flights of Lawrence Kelly and Ramsey covering 2700 mi. in 26 hr. 36 min. and the day-night flights of Lawrence Smith and Richter from Canada to Nevada, a distance of 2,000 mi. in 12 hr. 33 min. 46 sec. also are credited to the Air Service.

The Air Mail was nationwide grace by the success of day-night flying experiments between Omaha and Chicago. The record of 26 hr. 41 min. from coast to coast was made. The regular service of the Air Mail has become so accepted that it is no longer considered an achievement but it still remains the outstanding commercial success in the flying world.

In the recreational field the skywriting came into its own. Not only has it proved to be a success from the advertising standpoint but it has demonstrated that such work can be conducted safely and on a business-like basis. Aerial photography advanced to a position where it now has a recognized place in industry.

The Zeppelin-Gondola arrangement will probably show as strange in the lighter-than-air field for the coming year.

LESLIE J. O'NEILL
EDITOR
VICTOR E. CLARK
ASSISTANT EDITOR
EDWARD P. WARDEN
BUSINESS MANAGER
RUBEN H. UNGER
CIRCULATION MANAGER

Commercial operations of aircraft were below previous years although a total of several million miles were flown. The 16 Louis Moet surprised any similar event ever held. The use of aircraft in agriculture advanced to its own far crop survey, destruction of grapes, wheat and hull work.

AVIATION in recording these achievements looks forward to a most successful 1924 and takes this opportunity to wish its aeromated friends a happy and successful New Year.

An Air Minister's Visit

THE Duke of Sutherland, Under-Secretary for Air in the British Cabinet, whom says in the United States has been of such short duration that he has only had an opportunity to visit the British Office in a most interesting figure in the aviation world.

Not only is he a distinguished representative of British Nobility, and a man of large interests, but he has that rare distinction of being a member of a Cabinet where the Air Force is placed on a par with the Army and Navy. In some ways, The Royal Air Force is becoming more important and is the center of more discussion in England than the British Naval and Military forces. The premier work of the British Air Force is being observed carefully by every other country and the situation in the United States is the greatest progress of Great Britain has been hastened to with the greatest interest.

The Duke of Sutherland has been quoted as having said that Great Britain would welcome an Air Conference for the limitation of aircraft. Usually France is regarded as the nation that would object. In certain ways France might be pleased with such a conference as it would point to the basis of the agreement at the Washington Conference for the limitation of Naval Armament and argue that France should be entitled to the largest air force. As yet have mentioned before, until Germany and Russia can be included in any such agreement, we believe it is a hopeless idea.

The plans of the British Government to introduce commercial air routes is outlined by the Duke are of the greatest importance. The formation of a single company to operate all the British air routes and the plans for airway laws in India and Australia indicate the short attitude of Great Britain toward air problems. Unfortunately the words "subsidy" and "monopoly" are not popular in this country and while the English plan seems logical and practical, it holds little of promise for duplication here.

To have so distinguished a representative of the British Air Force come over and study our aviation is a great accomplishment. His friendly interest and cautious grace have created a very pleasing impression. His report will have been of great assistance in American aviation if it has shown the advantages to our country of having capable men who can place their direction to air progress above all other interests.

A New Process of Steel Cylinder Construction

By GLENN D. ANGLE

In charge of Aeghian Engine Design, Engineering Division, Air Service

As better or more suitable materials and processes of manufacturing are developed, either through demand or otherwise, as well progress is made in the design of all articles to which these improvements are applied. Consequently, a new application of a relatively old process will not only unfold surprising possibilities in improving certain designs but in reducing their manufacturing costs as well. As a example of this nature is the application of the electric butt-welding process (sometimes referred to as flash welding) to the construction of steel engine cylinders. As later shown, this process is particularly suited to the four-valve type.

Electric Butt-Welding

The four-valve valved steel engine cylinder is many times as difficult to design as one having only two valves. In the first place, with certain flash welding variations, the valve diameter considered necessary for maximum

apparently circumvents many of the most serious of these manufacturing problems by virtue of the butt welding process. That the methods are satisfactory has already been proved through the design and construction of a cylinder of this type and as compared with the usual castings, figures a cost of production show an almost inaudible reduction of nearly 30 per cent.

The cylinder head is formed by welding together two identical forgings, the plan and end views of which are shown by Fig. 1. The principal feature of the design, which is made possible by this construction, lies in the fact that the valve port is formed as an integral part of the cylinder head instead of being tapered and machined separately and then welded thereto according to the usual practice. The portion low of the forging due to the shape of the valve port being so. This allows the exterior of the port to be finished by use and therefore requires no additional machine operations. The draft stock on the outside diameter of the head can be later turned off in so to give an even thickness of metal around the cylinder head.

How Cylinder is Made

The forgings are first machined on the bottom in such that to be accurately located, and also in great good shape, as to be joined are also machined, leaving on each about three-fourths of the wall thickness more than the steel thickness from the cylinder neck to the plane of the valve port. This also provides a reasonably smooth and clear surface for welding.

The forgings are then clamped in copper dies with the joining edges turned to the axis of the cylinder. The finished surface on the bottom is given full contact with the die and such other required contacts are made during clamping as to give sufficient holding stress.

The cylinder head forgings are brought into contact and the electric current applied. In less than one minute, both are

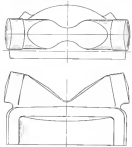


Fig. 1. Plan and end views of cylinder head forging

cylinder performance cannot always be met and still retain sufficient water space between each pair of ports for good valve seating. The spherical or dome-shaped combustion chamber, which is undoubtedly one of the most simple forms, cannot be employed with four valves unless a very special port action is adopted to compensate for the tilted axis of the valves. Without further detailed reference, it is obvious there are numerous design problems in connection with four valve cylinders, the nature of which will naturally vary among different types and types.

The above manufacturing difficulties, however, are the case with which the designer is chiefly concerned. These may be concentrated either in the forging, machining, or welding of the cylinder head and valve ports, and obviously require a knowledge of various facts as well as considerable experience before satisfactory cylinders can be produced in large quantities with top degree of uniformity.

The type of construction, which is about to be described,

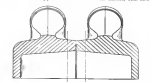


Fig. 2. The two sections of the cylinder head machined and in position to be electrically butt welded

resulted in a single head about one-half inch on either side of the joint, due to the reduction of the gap. If the pressure is then applied, further the two halves separate after about three minutes and upon reaching the desired location, the material is automatically cut off and the process is repeated. The entire, which now represents a source of trouble in most types of welded joints, are in this particular process blown out to the flash.

A metallurgical examination of the welded joint is one of these cylinders has proved that the welds are clean and well made, also tension specimens fracture beyond the weld in both untreated and heat treated material. It is concluded that

an method of construction, is essentially feasible—being equally well suited to quantity production and producing best results which cannot be attained ordinarily with any other form of steel cylinder construction.

The feature of making the cylinder head and valve ports integral has many advantages. Perhaps the most important of these is the elimination of the usual weld employed in attaching the two. The best applied in making this weld usually demands the valve port and some fitting in the cylinder and, possibly when the welds are then or the weld is made gas to the head. Attempts have been made to prevent distortion in forming the parts in a specially designed fixture during welding, but the method has not with little success because the welded surface only reflects themselves as soon as the parts are removed from the fixture. Neither have other attempts to prevent the trouble, such as pre-heating the parts to be joined or strengthening them in a die, either cold or hot, and chills, been highly successful.

Overcoming Various Difficulties

The possible means of overcoming difficulties of this kind in the cylinder head and valve ports, making other welding; but this is extremely not desirable, especially on the inside of the cylinder head. In some known instances, it has been

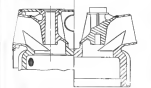


Fig. 3. The two final stages of construction

found to include a stress around the valve seat after welding in order to reduce the current height of the valve seat, but an even width of valve seat. Although this is accounted for in the making of the head, it may be due perhaps to some cause in the welding of the valve grade line.

The only possible means to avoid such conditions, other than that of making the head and valve port integral, is to use the joint above the head far enough to obtain a uniform full section due at least 3/16 to 1/4 in. each side of the joint. Machinery with one that be made with the head, and consequently less distortion, because the head due to however well as to be not rapid. Several instances are known in which among the joint eliminated a great deal of trouble.

In most valve cylinders, however, the length of the joint above the cylinder head has little to do with improving conditions in welding. It is always more or less of a problem to make a satisfactory weld between a pair of valve ports which are so close together. If the design does not actually prohibit making a satisfactory weld, it at least demands more time to do so.

Another objection often raised in connection with the integral valve port construction is the increased weight due to the valve seat. A valve given up its head is the clearly both by seat contact and through the valve stem. The top part of the head given up to the valve seat is naturally rounded through the valve seat, but if there is a weld joint with only partial continuity of metal, the valve seat is not so rounded. It is apparent that the type of construction herein described has no objectionable features as to weight.

The weight of a cylinder should be held to a minimum for the reasons, the overall dimensions and weight of the engine.

When the parts are made integral with the cylinder head, the valve seat is prepared by the welded joint between the valve port and cylinder head and is thus secured. This is best illustrated by Fig. 3, which also shows the construction of the valve grade line.

The upper end of Fig. 3 shows the valve port opening and the cylinder head machined. The valve grade line has been placed. The section of the left shows the completed cylinder with valve grade line and valve seat machined, and the final welding of the port flanges, top flange, and valve ports.

It is apparent that this construction introduces a new shape in valve ports, and one which can be readily produced as steel stress the machine operations are simple. Flakes are used concentric with the valve axis and removed in the port flange. The metal left after boring these holes is removed by a cutter, with a rounded end of the desired shape, that is introduced normal to the surface upon which the valve grade line is to be machined. The sharp corners remaining are easily removed by filing so that the port has a smooth contour, and the required cross section in any plane normal to the direction of gas flow.

One who has completed upon cylinders with no welded joint between the valve port and cylinder head indicate that the cooling of the valve seat is much improved, and it has also been shown that the valve stem is more effectively cooled with this design of valve grade line. Inside the covering features of this construction are represented by the above description, attention is drawn to the reality of the design which reduces the possibility of failure in the welded joint of the water jacket. This construction may be widely varied in its application, the particular design shown here being only one of several possibilities.

A Comprehensive Air Program

During a recent visit to Dayton, Ohio, Assistant Secretary of War Dwight F. Davis advocated the adoption by the United States of a comprehensive aeronautical policy and outlined how, in his opinion, aviation organizations can be of great assistance.

He recommended the following:

- (1) There should be appointed local committees for increasing governmental use of airplanes and giving thereto with some velocity.
- (2) There should be a special aerial section of all transportation committees for Chambers of Commerce and similar organizations, to study and publish data regarding aerial transportation.
- (3) Vigilance committees of all Chambers of Commerce to prevent organization of "wild cat" aerial navigation companies.
- (4) Commercial use of aircraft, by newspapers, department stores, express companies, real estate developers, photographers, surveyors and the like.
- (5) Coordination of all private organizations by a national association to insure intelligent presentation of aeronautical service needs to Congress.
- (6) Disposition of the popular misconception regarding the safety and reliability of the airplane in commerce.

Secretary Davis further outlined what the government can do. He said:

"First, it should suspend existing laws regarding competition in air, for government aircraft so that experimental work may be placed.

"Second, the standardization, as far as possible, of machinery, aerial and land types of aircraft.

"Third, the creation of a bureau, as far as possible, to private industries, handling its specifications for airplanes to improve performance, thus assisting in the building up of technicians capable of designing all types of aircraft.

"Fourth, promotion of the use of aircraft in the education of students, investigation and public health services.

"Fifth, establish aerial traffic laws.

"Sixth, take up with other nations the matter of an international air code."

Orders to Officers

Lt. Hag F. A. Bado, (MC) detached Naval Air Station San Diego to U.S.S. *Buget*.
 Lt. Howell G. Johnson, (MC) detached VT Squadron One, Aircraft Squadron, Fleet, to keep duty course instruction, Nav. Medical School, D. C.
 Lt. Jesse H. Vance, (MC) detached Nav. Hosp. No. 10, to VT Squadron One, Aircraft Squadron, Fleet.
 Lt. (jg) William M. Blahney, detached U.S.S. *Wright*, to keep duty course instruction, Nav. Air Sta. Pensacola.
 Ensign Apollo Bonnet, detached U.S.S. *Windsong*, to keep duty course instruction, Nav. Air Sta. Pensacola.
 Gun Officer A. Adams, detached U.S.S. *Arctostaphylos*, to Comde. 10 Cst., Battle Fleet.
 Gun Hugh T. Handy, to continue duty Nav. Air Sta. Pensacola, assigned by Comdt.
 Gun William E. Dunsen, detached U.S.S. *Wright*, to Scouting Fleet.
 Gun, Fred E. Nisbet, detached Nav. Air Sta. Hampton Roads, to Scouting Fleet.
 Gun, John T. Robertson, detached Nav. Air Sta., Latham, to Scouting Fleet.
 Lt. (jg) Richard F. Whitcomb, detached U.S.S. *Lansdowne*, to keep duty U.S.S. *Wright* (Order of Dec. 3).

Pressure Distribution Tests on C7

The pressure distribution tests with the new rigid airship C7, which have been going on for over a year at the Naval Air Station at Hampton Roads, Va., are being completed. The purpose of these tests has been to determine the magnitude and distribution of the air pressures on the envelope and related members of the airship while it was flying at various speeds and in various positions. The results have proved to be of great value, and many of them were used in connection with the design of the rigid airship "Shenandoah." To obtain further information for use in the design of possible future rigid, it is contemplated that a series of similar tests will be conducted with the "Shenandoah." This investigation was undertaken only after extensive preparations which occupied the better part of a year, so that the results now obtained represent two years of work. The analysis of the thousands of readings which have been taken is now in progress. This in turn will require a period of months. The taking of readings and their analysis is done by the Langley Field staff of the National Advisory Committee for Aeronautics, which has been cooperating with the Navy on this important project.

VF Squadron One in Night Flying Exercise

The following is quoted from a report from the Aircraft Squadron Battle Fleet on a recent night flying exercise held by VF Squadron One at Naval Air Station. "This Squadron conducted a night flying practice observing much valuable information with regard to night landing and observation of the birds. Landings were made in the air at angles of 30 degrees to the landing direction. Six ground lights were used 250 ft. apart in line with the cableways and parallel to the landing direction. Three gliders were used flying. Two were in the air at all times with one remaining on the operating line. Parachute landings were made and thirteen parachute flares were dropped. There were no casualties and the propellers with which the practice was conducted was badly damaged. A board machine gun firing was conducted by officers of VF Squadron One on the C7. Four pilots made some striking times in the Navy 'K.' The high score was made by Lt. Commander H. C. Work, with 28 hits out of 30 shots fired."

Officers Class Progressing Rapidly

The Naval Air Station at Pensacola, Fla., reports that Flight Training Class XIX, is progressing very rapidly. This class is composed of 28 Naval officers and 3 Marine Corps officers. A report from the station is as follows: "Good weather has favored Class XIX. Today (Dec. 31) fourteen members of the class are ready for recognition and the remaining members are on the last leg of their ten hour solo period in F3A. If weather continues good until the 22 of this month, it is hoped that this class will be graduated Naval Aviators, and that thirty-one new wings will be on parade."

Where to Fly

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